



# TEST REPORT

**Test Report No. : UL-RPT-RP11265293JD07M V3.0**

**Manufacturer** : Apple Inc.  
**Model No.** : A1785  
**FCC ID** : BCG-E3088A  
**Technology** : UMTS Band II  
**Test Standard(s)** : FCC Part 24 Subpart E

1. This test report shall not be reproduced in full or partial, without the written approval of UL VS LTD.
2. The results in this report apply only to the sample(s) tested.
3. The sample tested is in compliance with the above standard(s).
4. The test results in this report are traceable to the national or international standards.
5. Version 3.0 supersedes all previous versions.

**Date of Issue:** 03 August 2016

**Checked by:**

Ian Watch  
Senior Engineer, Radio Laboratory

**Company Signatory:**

Steven White  
Service Lead, Radio Laboratory  
UL VS LTD



This laboratory is accredited by UKAS.  
The tests reported herein have been  
performed in accordance with its terms  
of accreditation.

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## UL VS LTD

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**1. Customer Information**








<b>Company Name:</b>	Apple Inc.
<b>Address:</b>	1 Infinite Loop Cupertino, CA 95014 U.S.A

## **2. Summary of Testing**

### **2.1. General Information**

<b>Specification Reference:</b>	47CFR24
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications): Part 24 Subpart E (Personal Communication Services)
<b>Site Registration:</b>	209735
<b>Location of Testing:</b>	UL VS LTD, Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom
<b>Test Dates:</b>	02 June 2016 to 21 July 2016

### **2.2. Summary of Test Results**

<b>FCC Reference (47CFR)</b>	<b>Measurement</b>	<b>Result</b>
Part 24.232(c)	Transmitter Output Power (EIRP)	
Part 2.1049	Transmitter Occupied Bandwidth	
Part 2.1053/24.238	Transmitter Out of Band Radiated Emissions	
Part 2.1053/24.238	Transmitter Band Edge Radiated Emissions	
Part 2.1055/24.235	Transmitter Frequency Stability (Temperature and Voltage Variation)	
<b>Key to Results</b>  = Complied  = Did not comply		

### **2.3. Methods and Procedures**

<b>Reference:</b>	ANSI/TIA-603-D-2010
<b>Title:</b>	Land Mobile FM or PM Communications Equipment Measurements and performance Standards
<b>Title:</b>	FCC KDB 971168 D01 v02r02, October 17 2014
<b>Reference:</b>	Measurement Guidance for Certification of Licensed Digital Transmitters

### **2.4. Deviations from the Test Specification**

For the measurements contained within this test report, there were no deviations from, additions to, or exclusions from the test specification identified above.

### **3. Equipment Under Test (EUT)**

#### **3.1. Identification of Equipment Under Test (EUT)**

Brand Name:	Apple
Model Name or Number:	A1785
Test Sample IMEI:	358640070266615 ( <i>Conducted Sample #1</i> )
Hardware Version:	REV1.0
Software Version:	iOS: 14A298, BB FW: 0.25.02
FCC ID:	BCG-E3088A

Brand Name:	Apple
Model Name or Number:	A1785
Test Sample IMEI:	358640070087482 ( <i>Radiated Sample #1</i> )
Hardware Version:	REV1.0
Software Version:	iOS: 14A298, BB FW: 0.25.02
FCC ID:	BCG-E3088A

Brand Name:	Apple
Model Name or Number:	A1785
Test Sample IMEI:	358640070022893 ( <i>Radiated Sample #2</i> )
Hardware Version:	REV1.0
Software Version:	iOS: 14A298, BB FW: 0.25.02
FCC ID:	BCG-E3088A

Brand Name:	Apple
Model Name or Number:	A1785
Test Sample IMEI:	358640070309175 ( <i>Radiated Sample #3</i> )
Hardware Version:	REV1.0
Software Version:	iOS: 14A298, BB FW: 0.25.02
FCC ID:	BCG-E3088A

#### **3.2. Description of EUT**

The Equipment Under Test was a mobile phone with GSM/GPRS/EGPRS/UMTS/LTE/TD-SCDMA and CDMA technologies. It also supports IEEE 802.11a/b/g/n/ac, Bluetooth®, GPS and NFC. The rechargeable battery is not user accessible.

#### **3.3. Modifications Incorporated in the EUT**

No modifications were applied to the EUT during testing.

**3.4. Additional Information Related to Testing**

Technology Tested:	UMTS1900		
Type of Radio Device:	Transceiver		
Mode:	UMTS FDD II		
Modulation Type:	QPSK / 8PSK		
Channel Spacing:	5 MHz		
Power Supply Requirement(s):	Nominal	3.8 VDC	
	Minimum	3.4 VDC	
	Maximum	4.3 VDC	
Transmit Frequency Range:	1850 to 1910 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	9262	1852.4
	Middle	9400	1880.0
	Top	9538	1907.6

**3.5. Support Equipment**

The following support equipment was used to exercise the EUT during testing:

<b>Description:</b>	Laptop PC
<b>Brand Name:</b>	Dell
<b>Model Name or Number:</b>	Latitude E5410
<b>Serial Number:</b>	UL Asset No. 00763

<b>Description:</b>	USB diagnostic cable
<b>Brand Name:</b>	Not stated
<b>Model Name or Number:</b>	Kong
<b>Serial Number:</b>	202D5E

<b>Description:</b>	Personal Hands Free (PHF)
<b>Brand Name:</b>	Apple
<b>Model Name or Number:</b>	Apple Ear Plugs
<b>Serial Number:</b>	Not stated

## **4. Operation and Monitoring of the EUT during Testing**

### **4.1. Operating Modes**

The EUT was tested in the following operating mode(s):

- Constantly transmitting at full power on bottom, middle and top channels as required.
- Occupied bandwidth, EIRP and band edge tests were performed with the EUT in RMC (12.2 kbps), HSDPA (Sub-tests 1 to 4) or HSUPA (Sub-tests 1 to 5) modes.
- Transmitter radiated spurious emissions were checked in all modes during pre-scans. HSUPA Sub-Test 3 was found to be the worst case and all final measurements were performed with the EUT in this mode.

### **4.2. Configuration and Peripherals**

The EUT was tested in the following configuration(s):

- The EUT was placed into a non-ui mode by using the teraterm application on a UL laptop PC. Instructions were provided by the customer to enable the baseband and radio (*Cellular\_RSE\_setup\_V3.0.doc*). This enabled the EUT to connect via a radiated link with the Rohde & Schwarz CMW 500 system simulator operating in transceiver mode. The CMW 500 was used to configure the EUT operating mode.
- Transmitter radiated spurious emissions tests were performed with the PHF connected to the EUT as the declared by the customer. The EUT was placed in three orthogonal orientations X, Y and Z to determine the worst case orientation for radiated spurious emissions. The worst case orientation for the LAT was Z and for the UAT was Z. Measurements at band edges were performed with the PHF removed as this was found to be the worst case.
- The worst-case radiated emission among all accessories, is determined by the manufacturer to be with the headset connected. The compliance lab performed final testing only with the headset attached.
- Testing for frequency stability and measurements at temperature and voltage extremes were performed using a conducted sample supplied by the customer. Short 4-wire DC flying leads were connected internally to the device in place of the battery, and exited through a hole in the casing. These leads were then extended to a DC power supply for testing purposes.
- For conducted cellular measurements, the RF conducted port was created by removing a micro connector from the PCB antenna and extending it with a short flexible microstrip supplied by the customer. This microstrip exited the device through a hole in the casing and was terminated in a proprietary micro-coax to SMA adaptor.
- The device contains two cellular antennas which do not transmit simultaneously.
  - o LAT – Lower Antenna (Primary)
  - o UAT – Upper Antenna (Secondary)

Where applicable, both antennas have been tested to demonstrate compliance.



## **5. Measurements, Examinations and Derived Results**

### **5.1. General Comments**

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to *Section 6. Measurement Uncertainty* for details.

In accordance with UKAS requirements all the measurement equipment is on a calibration schedule. All equipment was within the calibration period on the date of testing.

## 5.2. Test Results

### 5.2.1. Transmitter Output Power (EIRP) - LAT

#### Test Summary:

Test Engineer:	Roy Chen	Test Date:	19 July 2016
Test Sample IMEI:	358640070266615		

FCC Reference:	Part 24.232(c)
Test Method Used:	KDB 971168 D01 Section 5.1.1 and 5.2.1

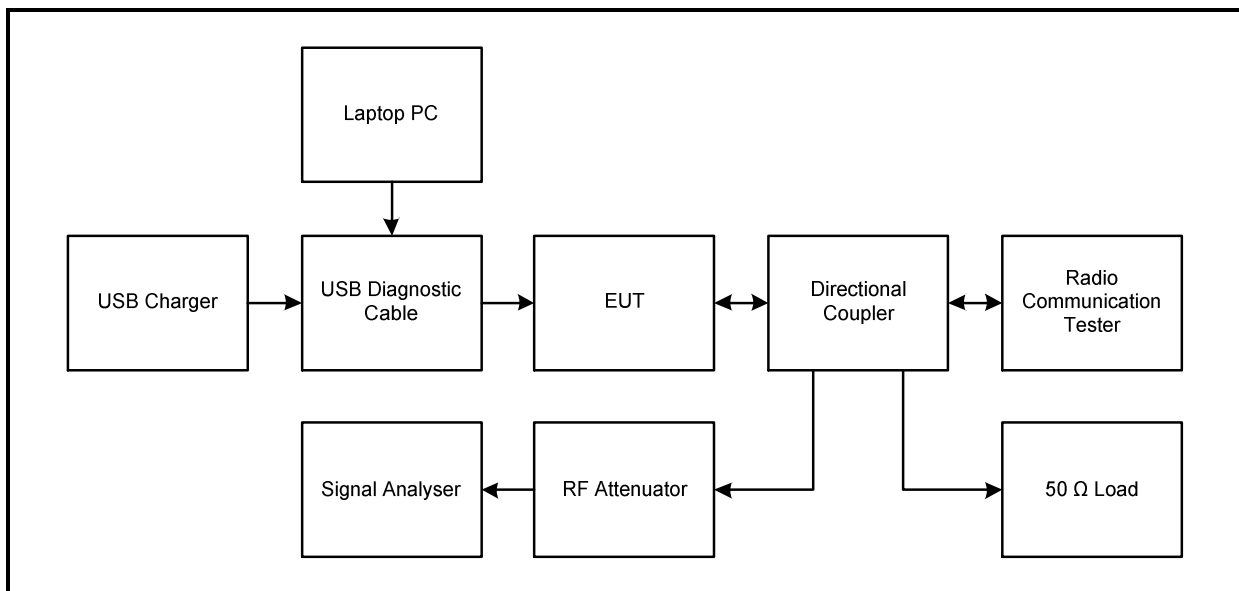
#### Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	39

#### Note(s):

1. All modes were compared on each channel and the highest power recorded was subtracted from the limit to show the margin.
2. The signal analyser was connected to the RF port on the EUT via the coupled port on an RF coupler using suitable attenuation and RF cables. An RF level offset was entered on the signal analyser to compensate for the loss of the coupler, attenuators and RF cables. The through port on the RF coupler was connected to an R&S CMW 500 Radio Communications Tester.
3. The EUT was transmitting at maximum power on a single channel.
4. The customer stated a maximum antenna gain of 0.9 dBi. The antenna gain was added to the conducted output power to obtain the EIRP.

#### Test setup:



**Transmitter Output Power (EIRP) (continued)****Results: Peak EIRP / HSDPA and RMC**

Modes		HSDPA				RMC			
Sub-test		1	2	3	4	12.2 kbps			
Band	Channel	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Limit (dBm)	Margin (dB)	Result
1900	9262	28.2	29.5	29.5	29.4	29.1	33.0	3.5	Complied
	9400	28.7	29.1	29.1	29.1	28.7	33.0	3.9	Complied
	9538	27.6	29.0	29.0	29.0	28.6	33.0	4.0	Complied
$\beta_c$		2	11	15	15				
$\beta_d$		15	15	8	4				
$\Delta ACK, \Delta NACK, \Delta CQI$		8	8	8	8				

**Results: Peak EIRP / HSUPA**

Modes		HSUPA							
Sub-test		1	2	3	4	5			
Band	Channel	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Limit (dBm)	Margin (dB)	Result
1900	9262	29.6	28.6	29.7	29.5	29.5	33.0	3.3	Complied
	9400	29.2	28.2	29.5	28.3	29.2	33.0	3.5	Complied
	9538	28.9	28.7	29.0	28.9	28.9	33.0	4.0	Complied
$\beta_c$		11	6	15	2	15			
$\beta_d$		15	15	9	15	1			
$\Delta ACK, \Delta NACK, \Delta CQI$		8	8	8	8	8			

**Transmitter Output Power (EIRP) (continued)****Results: RMS EIRP / HSDPA and RMC**

Modes		HSDPA				RMC			
Sub-test		1	2	3	4	12.2 kbps			
Band	Channel	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Limit (dBm)	Margin (dB)	Result
1900	9262	24.5	22.9	21.8	21.9	25.8	33.0	7.2	Complied
	9400	24.8	23.1	22.2	22.0	26.1	33.0	6.9	Complied
	9538	24.6	23.0	22.0	21.9	25.7	33.0	7.3	Complied
$\beta_c$		2	11	15	15				
$\beta_d$		15	15	8	4				
$\Delta ACK, \Delta NACK, \Delta CQI$		8	8	8	8				

**Results: RMS EIRP / HSUPA**

Modes		HSUPA							
Sub-test		1	2	3	4	5			
Band	Channel	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Limit (dBm)	Margin (dB)	Result
1900	9262	23.8	23.8	24.9	24.8	24.4	33.0	8.1	Complied
	9400	24.0	24.5	25.0	25.0	24.6	33.0	8.0	Complied
	9538	23.8	23.6	24.7	24.6	24.2	33.0	8.3	Complied
$\beta_c$		11	6	15	2	15			
$\beta_d$		15	15	9	15	1			
$\Delta ACK, \Delta NACK, \Delta CQI$		8	8	8	8	8			

**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2002	Thermohygrometer	Testo	608-H1	45041825	02 Apr 2017	12
A2503	Directional Coupler	AtlanTecRF	CDC-003060-10	13122501838	Calibrated before use	-
A2527	Attenuator	AtlanTecRF	AN18W5-20	832828#2	Calibrated before use	-
M1996	Signal Analyser	Rohde & Schwarz	FSV13	100975	02 Mar 2017	12
M1145	Power Meter	Hewlett Packard	437B	3737U26557	11 Aug 2016	12
M283	Thermal Power Sensor	Hewlett Packard	8487A	3318A03241	27 Apr 2017	12
G0608	Signal Generator	Rohde & Schwarz	SMIQ 06B	838341/033	29 Apr 2017	12

**Transmitter Dual Channel Output Power (EIRP) - LAT****Test Summary:**

<b>Test Engineer:</b>	Roy Chen	<b>Test Date:</b>	19 July 2016
<b>Test Sample IMEI:</b>	358640070266615		

<b>FCC Reference:</b>	Part 24.232(c)
<b>Test Method Used:</b>	KDB 971168 D01 Section 5.1.1 and 5.2.1

**Environmental Conditions:**

<b>Temperature (°C):</b>	23
<b>Relative Humidity (%):</b>	39

**Note(s):**

1. All modes were compared on each channel and the highest power recorded was subtracted from the limit to show the margin.
2. The signal analyser was connected to the RF port on the EUT via the coupled port on an RF coupler using suitable attenuation and RF cables. An RF level offset was entered on the signal analyser to compensate for the loss of the coupler, attenuators and RF cables. The through port on the RF coupler was connected to an R&S CMW 500 Radio Communications Tester.
3. The EUT was transmitting at maximum power in Dual Carrier HSDPA mode.
4. The customer stated a maximum antenna gain of 0.9 dBi. The antenna gain was added to the conducted output power to obtain the EIRP.

**Transmitter Dual Carrier Output Power (EIRP) (continued)****Results: Peak EIRP / Dual Carrier HSDPA**

Modes		HSDPA						
Sub-test		1	2	3	4			
Band	Channel	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Limit (dBm)	Margin (dB)	Result
1900	9262	28.3	29.5	29.4	29.5	33.0	3.5	Complied
	9400	28.8	29.2	29.0	29.0	33.0	3.8	Complied
	9538	27.9	29.1	29.1	29.1	33.0	3.9	Complied
$\beta_c$		2	11	15	15			
$\beta_d$		15	15	8	4			
$\Delta ACK, \Delta NACK, \Delta CQI$		8	8	8	8			

**Results: RMS EIRP / Dual Carrier HSDPA**

Modes		HSDPA						
Sub-test		1	2	3	4			
Band	Channel	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Limit (dBm)	Margin (dB)	Result
1900	9262	24.5	23.0	22.0	22.2	33.0	8.5	Complied
	9400	25.0	23.0	22.3	22.0	33.0	8.0	Complied
	9538	24.6	22.8	21.9	22.0	33.0	8.4	Complied
$\beta_c$		2	11	15	15			
$\beta_d$		15	15	8	4			
$\Delta ACK, \Delta NACK, \Delta CQI$		8	8	8	8			

**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2002	Thermohygrometer	Testo	608-H1	45041825	02 Apr 2017	12
A2503	Directional Coupler	AtlanTecRF	CDC-003060-10	13122501838	Calibrated before use	-
A2527	Attenuator	AtlanTecRF	AN18W5-20	832828#2	Calibrated before use	-
M1996	Signal Analyser	Rohde & Schwarz	FSV13	100975	02 Mar 2017	12
M1145	Power Meter	Hewlett Packard	437B	3737U26557	11 Aug 2016	12
M283	Thermal Power Sensor	Hewlett Packard	8487A	3318A03241	27 Apr 2017	12
G0608	Signal Generator	Rohde & Schwarz	SMIQ 06B	838341/033	29 Apr 2017	12

**5.2.2. Transmitter Output Power (EIRP) - UAT****Test Summary:**

<b>Test Engineer:</b>	Roy Chen	<b>Test Date:</b>	19 July 2016
<b>Test Sample IMEI:</b>	358640070266615		

<b>FCC Reference:</b>	Part 24.232(c)
<b>Test Method Used:</b>	KDB 971168 D01 Section 5.1.1 and 5.2.1

**Environmental Conditions:**

<b>Temperature (°C):</b>	23
<b>Relative Humidity (%):</b>	39

**Note(s):**

1. All modes were compared on each channel and the highest power recorded was subtracted from the limit to show the margin.
2. The signal analyser was connected to the RF port on the EUT via the coupled port on an RF coupler using suitable attenuation and RF cables. An RF level offset was entered on the signal analyser to compensate for the loss of the coupler, attenuators and RF cables. The through port on the RF coupler was connected to an R&S CMW 500 Radio Communications Tester.
3. The EUT was transmitting at maximum power on a single channel.
4. The customer stated a maximum antenna gain of -0.7 dBi.
5. The antenna gain was added to the conducted output power to obtain the EIRP.

**Transmitter Output Power (EIRP) (continued)****Results: Peak EIRP / HSDPA and RMC**

Modes		HSDPA				RMC			
Sub-test		1	2	3	4	12.2 kbps			
Band	Channel	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Limit (dBm)	Margin (dB)	Result
1900	9262	18.8	19.9	19.9	20.0	19.7	33.0	13.0	Complied
	9400	18.5	19.6	19.6	19.6	19.2	33.0	13.4	Complied
	9538	18.5	19.4	19.4	19.4	19.2	33.0	13.6	Complied
$\beta_c$		2	11	15	15				
$\beta_d$		15	15	8	4				
$\Delta ACK, \Delta NACK, \Delta CQI$		8	8	8	8				

**Results: Peak EIRP / HSUPA**

Modes		HSUPA							
Sub-test		1	2	3	4	5			
Band	Channel	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Limit (dBm)	Margin (dB)	Result
1900	9262	20.0	19.3	20.1	19.0	20.1	33.0	12.9	Complied
	9400	19.7	18.9	19.9	18.6	19.8	33.0	13.1	Complied
	9538	19.6	19.1	19.5	18.6	19.7	33.0	13.3	Complied
$\beta_c$		11	6	15	2	15			
$\beta_d$		15	15	9	15	1			
$\Delta ACK, \Delta NACK, \Delta CQI$		8	8	8	8	8			



**Transmitter Output Power (EIRP) (continued)****Results: RMS EIRP / HSDPA and RMC**

Modes		HSDPA				RMC			
Sub-test		1	2	3	4	12.2 kbps			
Band	Channel	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Limit (dBm)	Margin (dB)	Result
1900	9262	18.0	16.4	15.7	15.6	19.4	33.0	13.6	Complied
	9400	18.2	16.5	16.0	15.5	19.7	33.0	13.3	Complied
	9538	18.0	16.3	15.9	15.6	19.4	33.0	13.6	Complied
$\beta_c$		2	11	15	15				
$\beta_d$		15	15	8	4				
$\Delta ACK, \Delta NACK, \Delta CQI$		8	8	8	8				

**Results: RMS EIRP / HSUPA**

Modes		HSUPA							
Sub-test		1	2	3	4	5			
Band	Channel	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Limit (dBm)	Margin (dB)	Result
1900	9262	18.3	17.8	18.3	18.3	17.8	38.5	20.2	Complied
	9400	18.5	18.1	18.4	18.4	18.1	38.5	20.0	Complied
	9538	18.3	17.9	18.3	18.2	17.9	38.5	20.2	Complied
$\beta_c$		11	6	15	2	15			
$\beta_d$		15	15	9	15	1			
$\Delta ACK, \Delta NACK, \Delta CQI$		8	8	8	8	8			

**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2002	Thermohygrometer	Testo	608-H1	45041825	02 Apr 2017	12
A2503	Directional Coupler	AtlanTecRF	CDC-003060-10	13122501838	Calibrated before use	-
A2527	Attenuator	AtlanTecRF	AN18W5-20	832828#2	Calibrated before use	-
M1996	Signal Analyser	Rohde & Schwarz	FSV13	100975	02 Mar 2017	12
M1145	Power Meter	Hewlett Packard	437B	3737U26557	11 Aug 2016	12
M283	Thermal Power Sensor	Hewlett Packard	8487A	3318A03241	27 Apr 2017	12
G0608	Signal Generator	Rohde & Schwarz	SMIQ 06B	838341/033	29 Apr 2017	12

**Transmitter Dual Channel Output Power (EIRP) - UAT****Test Summary:**

<b>Test Engineer:</b>	Roy Chen	<b>Test Date:</b>	19 July 2016
<b>Test Sample IMEI:</b>	358640070266615		

<b>FCC Reference:</b>	Part 24.232(c)
<b>Test Method Used:</b>	KDB 971168 D01 Section 5.1.1 and 5.2.1

**Environmental Conditions:**

<b>Temperature (°C):</b>	23
<b>Relative Humidity (%):</b>	39

**Note(s):**

1. All modes were compared on each channel and the highest power recorded was subtracted from the limit to show the margin.
2. The signal analyser was connected to the RF port on the EUT via the coupled port on an RF coupler using suitable attenuation and RF cables. An RF level offset was entered on the signal analyser to compensate for the loss of the coupler, attenuators and RF cables. The through port on the RF coupler was connected to an R&S CMW 500 Radio Communications Tester.
3. The EUT was transmitting at maximum power in Dual Carrier HSDPA mode.
4. The customer stated a maximum antenna gain of -0.7 dBi.
5. The antenna gain was added to the conducted output power to obtain the EIRP.

**Transmitter Output Power (EIRP) (continued)****Results: Peak EIRP / Dual Carrier HSDPA**

Modes		HSDPA						
Sub-test		1	2	3	4			
Band	Channel	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Limit (dBm)	Margin (dB)	Result
1900	9262	18.7	19.9	19.8	19.9	33.0	13.1	Complied
	9400	18.4	19.5	19.5	19.6	33.0	13.4	Complied
	9538	18.5	19.3	19.4	19.4	33.0	13.6	Complied
$\beta_c$		2	11	15	15			
$\beta_d$		15	15	8	4			
$\Delta ACK, \Delta NACK, \Delta CQI$		8	8	8	8			

**Results: RMS EIRP / Dual Carrier HSDPA**

Modes		HSDPA						
Sub-test		1	2	3	4			
Band	Channel	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Limit (dBm)	Margin (dB)	Result
1900	9262	18.2	16.5	15.5	15.3	33.0	14.8	Complied
	9400	18.3	16.7	15.6	15.4	33.0	14.7	Complied
	9538	18.3	16.7	15.6	15.2	33.0	14.7	Complied
$\beta_c$		2	11	15	15			
$\beta_d$		15	15	8	4			
$\Delta ACK, \Delta NACK, \Delta CQI$		8	8	8	8			

**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2002	Thermohygrometer	Testo	608-H1	45041825	02 Apr 2017	12
A2503	Directional Coupler	AtlanTecRF	CDC-003060-10	13122501838	Calibrated before use	-
A2527	Attenuator	AtlanTecRF	AN18W5-20	832828#2	Calibrated before use	-
M1996	Signal Analyser	Rohde & Schwarz	FSV13	100975	02 Mar 2017	12
M1145	Power Meter	Hewlett Packard	437B	3737U26557	11 Aug 2016	12
M283	Thermal Power Sensor	Hewlett Packard	8487A	3318A03241	27 Apr 2017	12
G0608	Signal Generator	Rohde & Schwarz	SMIQ 06B	838341/033	29 Apr 2017	12

### 5.2.3. Transmitter Occupied Bandwidth

#### Test Summary:

Test Engineer:	Roy Chen	Test Date:	18 July 2016
Test Sample IMEI:	358640070266615		

FCC Reference:	Part 2.1049
Test Method Used:	KDB 971168 D01 Section 4.2

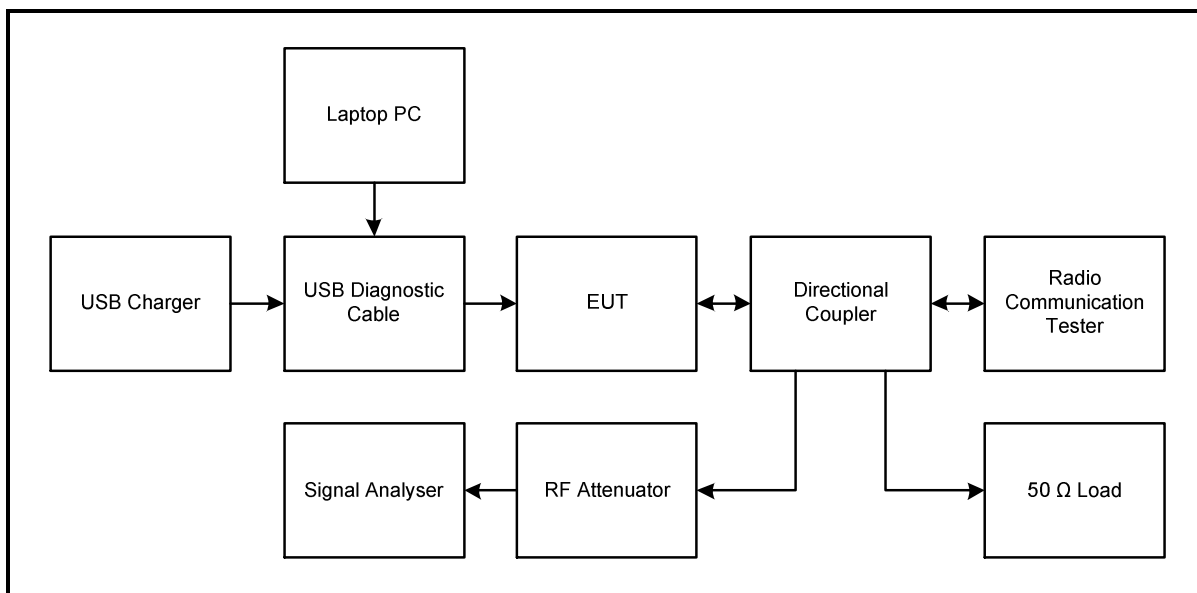
#### Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	44

#### Note(s):

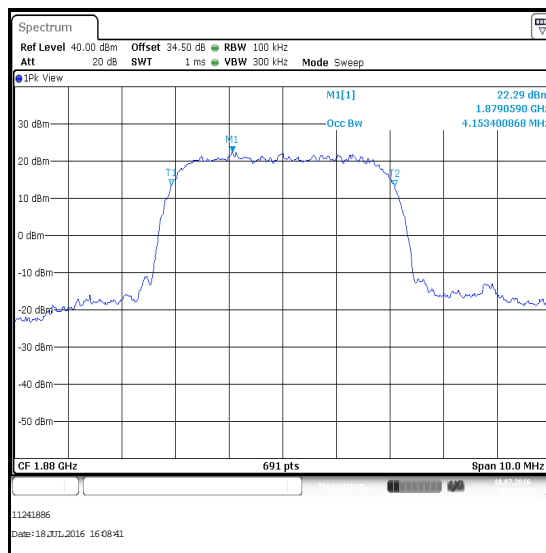
1. Occupied bandwidth (99% bandwidth) was measured using a signal analyser occupied bandwidth function.
2. The signal analyser was connected to the RF port on the EUT via the coupled port on an RF coupler using suitable attenuation and RF cables. An RF level offset was entered on the signal analyser to compensate for the loss of the coupler, attenuators and RF cables. The through port on the RF coupler was connected to an R&S CMW 500 Radio Communications Tester.

#### Test setup:



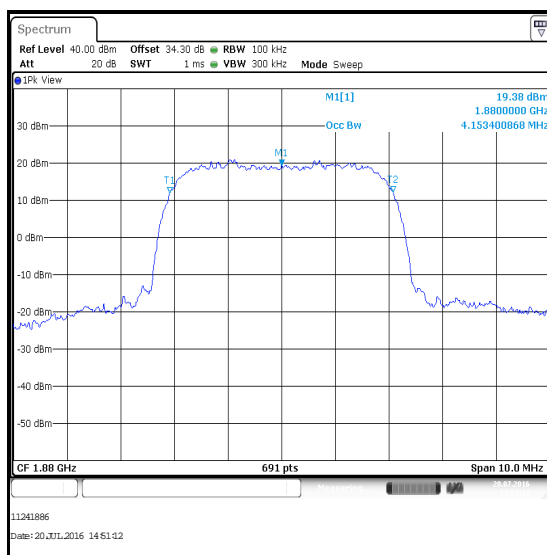
**Transmitter Occupied Bandwidth (continued)****Results: RMC / 12.2 kbps**

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	1880.0	4153.401

**Middle Channel**

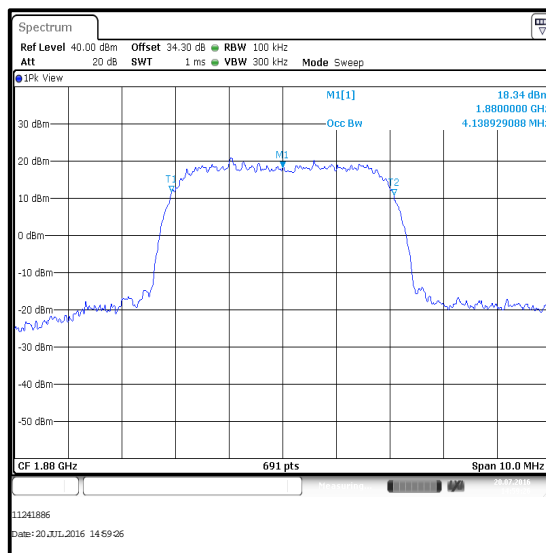
**Transmitter Occupied Bandwidth (continued)****Results: HSDPA Sub-Test 1**

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	1880.0	4153.401

**Middle Channel**

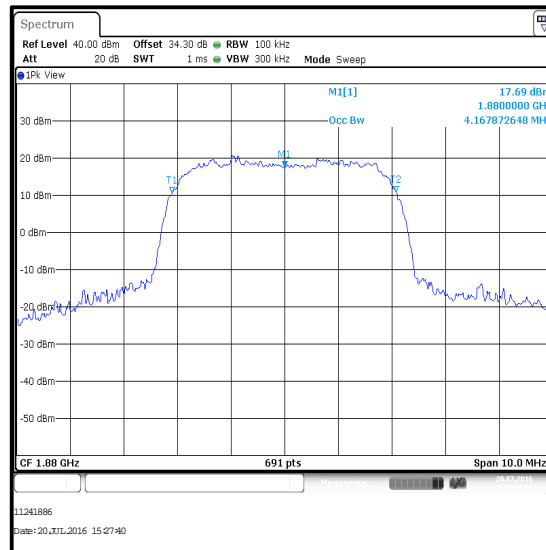
**Transmitter Occupied Bandwidth (continued)****Results: HSDPA Sub-Test 2**

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	1880.0	4138.929

**Middle Channel**

**Transmitter Occupied Bandwidth (continued)****Results: HSDPA Sub-Test 3**

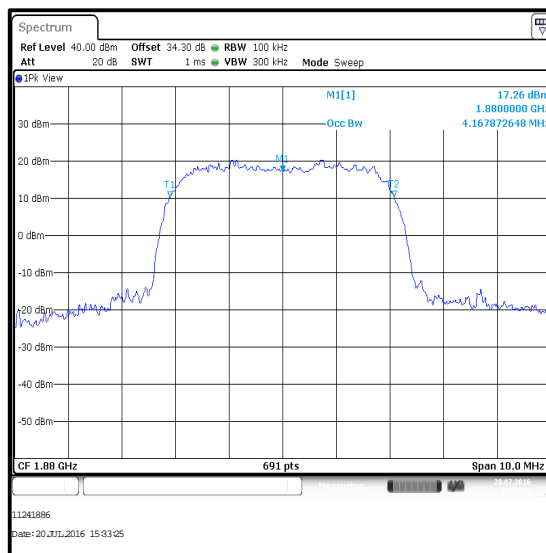
Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	1880.0	4167.873

**Middle Channel**



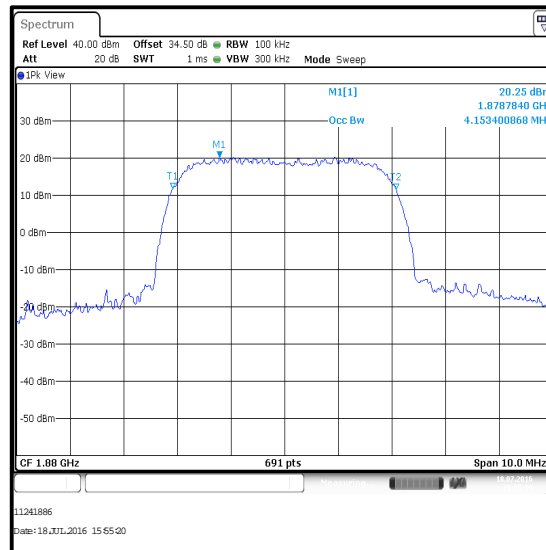
**Transmitter Occupied Bandwidth (continued)****Results: HSDPA Sub-Test 4**

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	1880.0	4167.873

**Middle Channel**

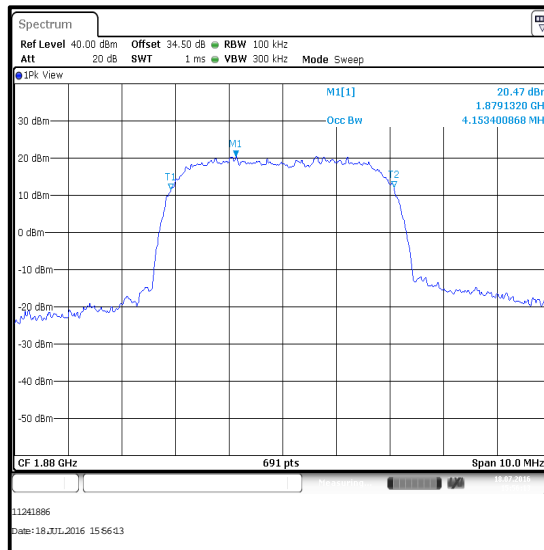
**Transmitter Occupied Bandwidth (continued)****Results: HSUPA Sub-Test 1**

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	1880.0	4153.401

**Middle Channel**

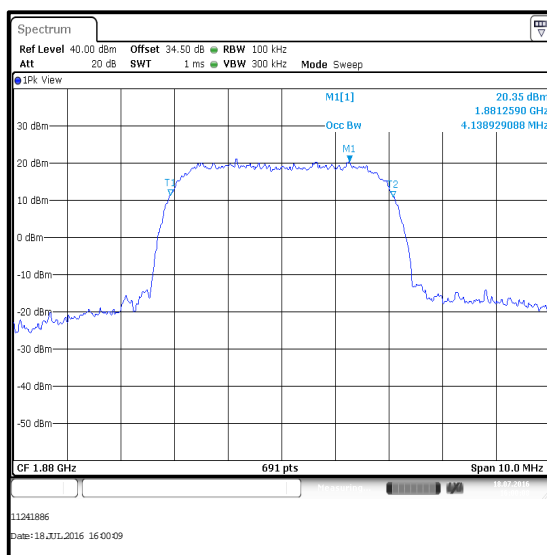
**Transmitter Occupied Bandwidth (continued)****Results: HSUPA Sub-Test 2**

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	1880.0	4153.401

**Middle Channel**

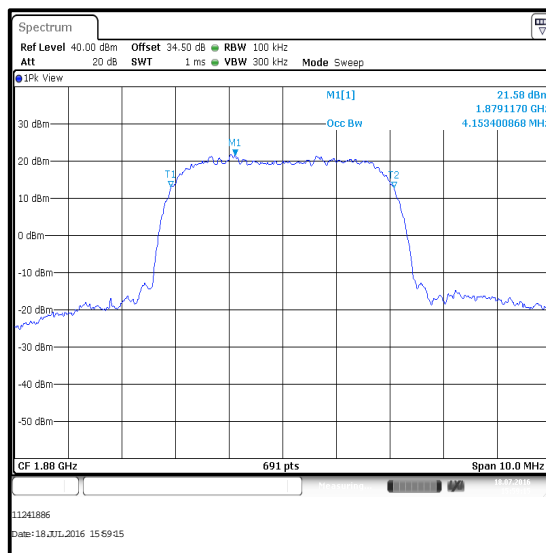
**Transmitter Occupied Bandwidth (continued)****Results: HSUPA Sub-Test 3**

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	1880.0	4138.929

**Middle Channel**

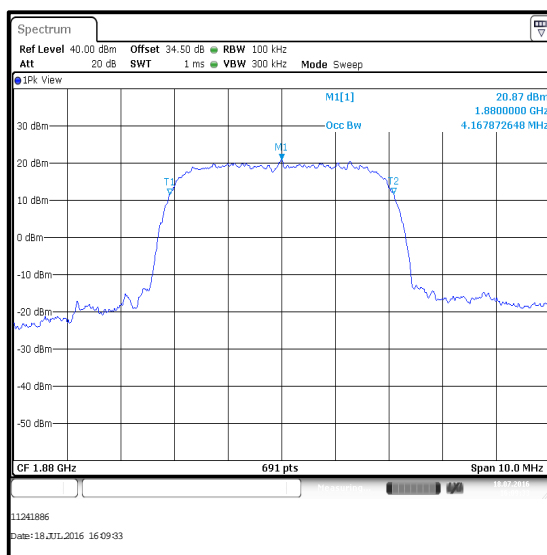
**Transmitter Occupied Bandwidth (continued)****Results: HSUPA Sub-Test 4**

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	1880.0	4153.401

**Middle Channel**

**Transmitter Occupied Bandwidth (continued)****Results: HSUPA Sub-Test 5**

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	1880.0	4167.873

**Middle Channel****Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2002	Thermohygrometer	Testo	608-H1	45041825	02 Apr 2017	12
A2503	Directional Coupler	AtlanTecRF	CDC-003060-10	13122501838	Calibrated before use	-
A2527	Attenuator	AtlanTecRF	AN18W5-20	832828#2	Calibrated before use	-
M1996	Signal Analyser	Rohde & Schwarz	FSV13	100975	02 Mar 2017	12
M1145	Power Meter	Hewlett Packard	437B	3737U26557	11 Aug 2016	12
M283	Thermal Power Sensor	Hewlett Packard	8487A	3318A03241	27 Apr 2017	12
G0608	Signal Generator	Rohde & Schwarz	SMIQ 06B	838341/033	29 Apr 2017	12

**5.2.4. Transmitter Out of Band Radiated Emissions - LAT****Test Summary:**

<b>Test Engineer:</b>	David Doyle	<b>Test Dates:</b>	18 July 2016 & 21 July 2016
<b>Test Sample IMEI:</b>	358640070087482		

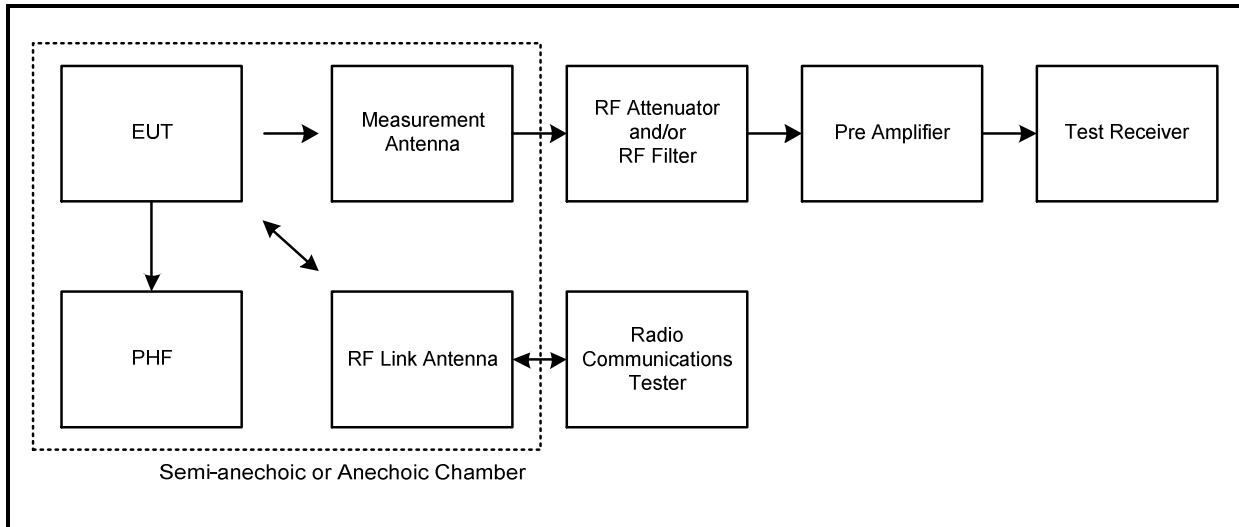
<b>FCC Reference:</b>	Parts 2.1053 & 24.238
<b>Test Method Used:</b>	KDB 971168 D01 Section 6.1 referencing FCC Part 2.1053
<b>Frequency Range:</b>	30 MHz to 20 GHz
<b>Configuration:</b>	HSUPA Sub-Test 3

**Environmental Conditions:**

<b>Temperature (°C):</b>	24 to 26
<b>Relative Humidity (%):</b>	43 to 44

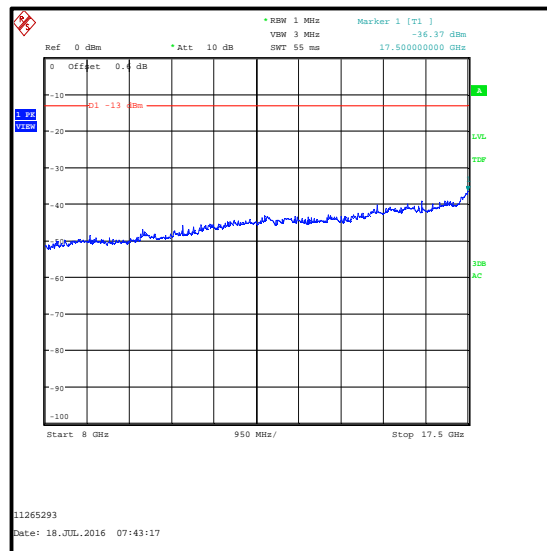
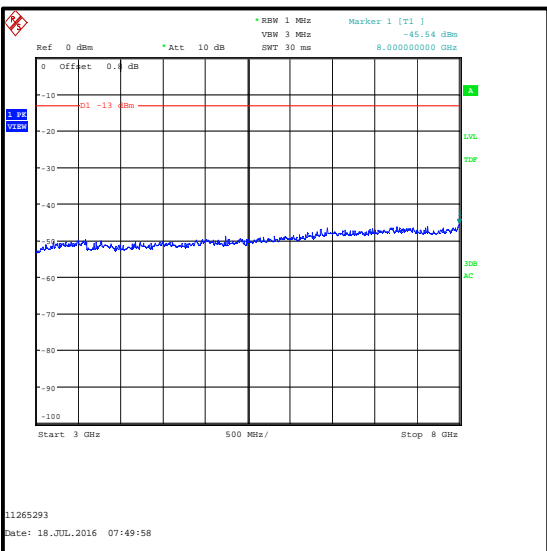
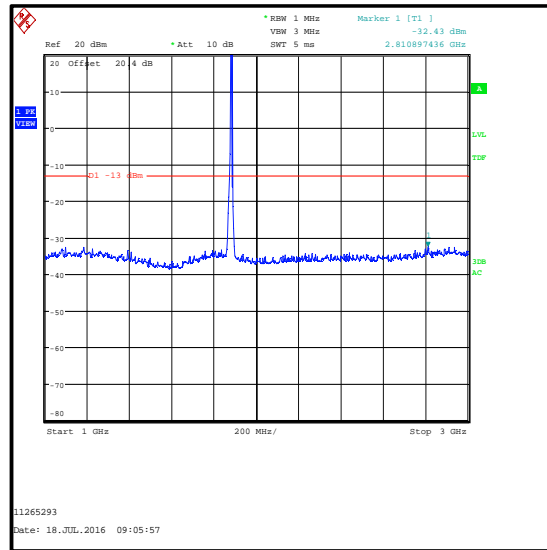
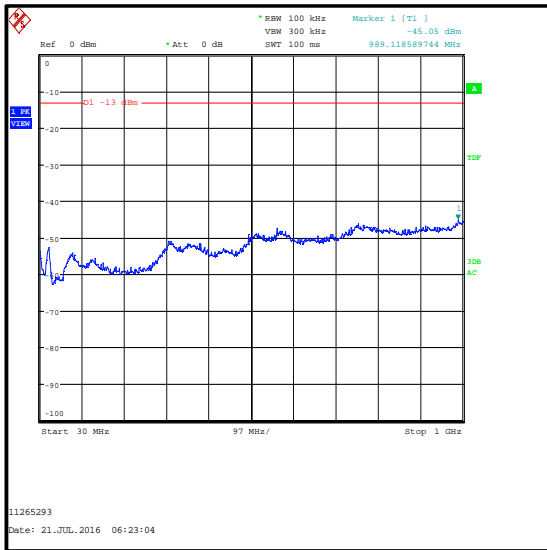
**Note(s):**

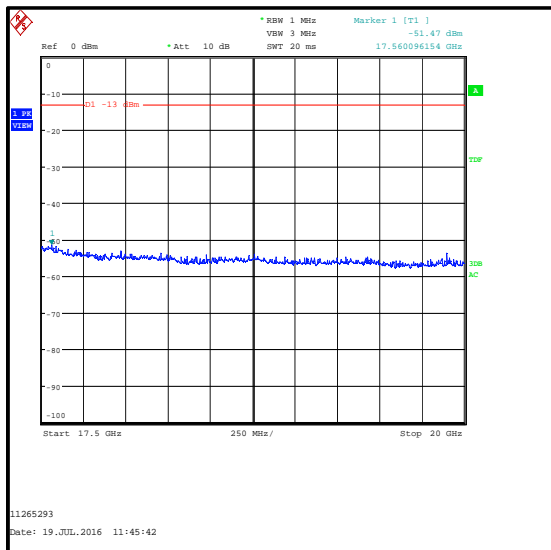
1. The uplink traffic channel is shown on the 1 GHz to 3 GHz plot.
2. No spurious emissions were detected above the noise floor of the measuring receiver, therefore the highest peak noise floor reading of the measuring receiver was recorded.
3. Middle channel results are recorded in this report and are representative of bottom and top channel results which are held on the UL IT server and available for inspection on request.
4. Measurements were performed in a semi-anechoic/fully anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres. A peak detector and trace mode of Max Hold were used to perform pre-scans, with markers placed on the highest measured levels.
5. Radiated spurious emission testing between 150 kHz and 30 MHz was performed for support of the NFC test report. No spurious emissions were observed above the noise floor of the measurement system.

**Transmitter Out of Band Radiated Emissions (continued)****Test setup for radiated measurements:****Results: HSUPA Sub-Test 3 - Middle Channel**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
2810.897	-32.4	-13.0	19.4	Complied



**Transmitter Out of Band Radiated Emissions (continued)**

**Transmitter Out of Band Radiated Emissions (continued)****Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2003	Thermohygrometer	Testo	608-H1	45046641	22 Apr 2017	12
K0017	3m RSE Chamber	Rainford EMC	N/A	N/A	17 May 2017	12
M1995	Test Receiver	Rohde & Schwarz	ESU40	100428	21 Mar 2017	12
A2889	Antenna	Schwarzbeck	BBHA 9120 B	BBHA 9120 B	07 Apr 2017	12
A2890	Antenna	Schwarzbeck	HWRD 750	014	06 May 2017	12
A2892	Antenna	Schwarzbeck	BBHA 9170	9170-727	07 Apr 2017	12
A2863	Pre-Amplifier	Agilent	8449B	3008A02100	07 Jan 2017	12
A2891	Pre-Amplifier	Schwarzbeck	BBV 9718	9718-306	07 Apr 2017	12
A2893	Pre-Amplifier	Schwarzbeck	BBV 9721	9721-021	07 Apr 2017	12
A2914	High Pass Filter	AtlanTecRF	AFH-03000	2155	19 May 2017	12
A2918	Attenuator	AtlanTecRF	AN185W-20	832828#1	19 May 2017	12

**5.2.5. Transmitter Out of Band Radiated Emissions - UAT****Test Summary:**

<b>Test Engineer:</b>	David Doyle	<b>Test Dates:</b>	18 July 2016 & 21 July 2016
<b>Test Sample IMEI:</b>	358640070022893		

<b>FCC Reference:</b>	Parts 2.1053 & 24.238
<b>Test Method Used:</b>	KDB 971168 D01 Section 6.1
<b>Frequency Range:</b>	30 MHz to 20 GHz
<b>Configuration:</b>	HSUPA Sub-Test 3

**Environmental Conditions:**

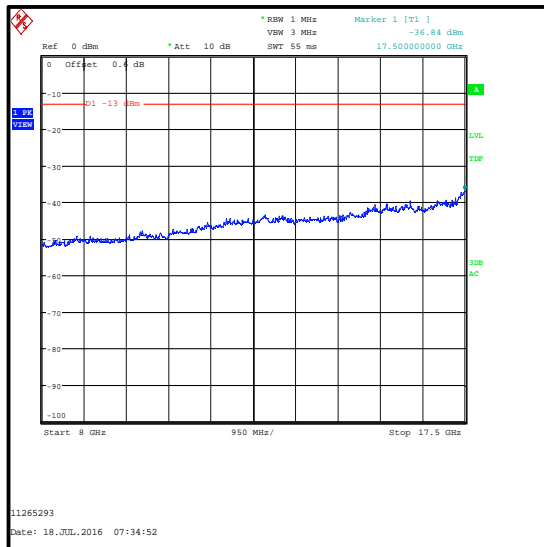
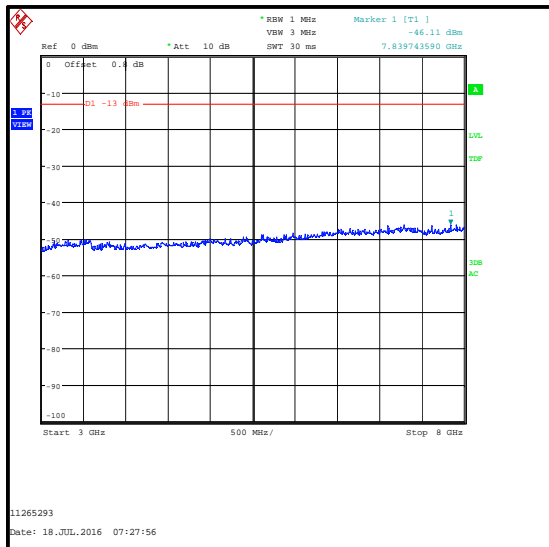
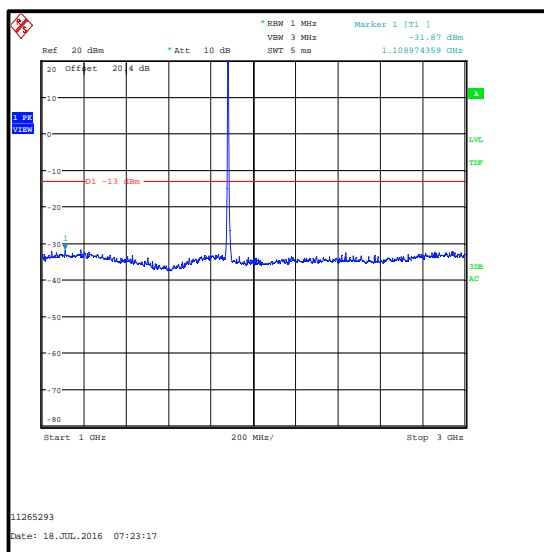
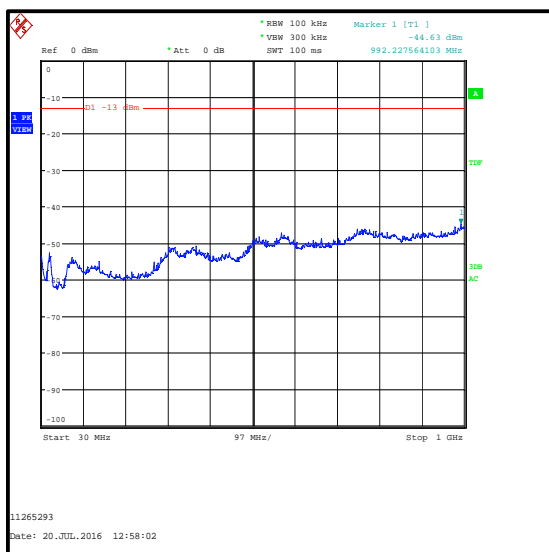
<b>Temperature (°C):</b>	24 to 26
<b>Relative Humidity (%):</b>	43 to 44

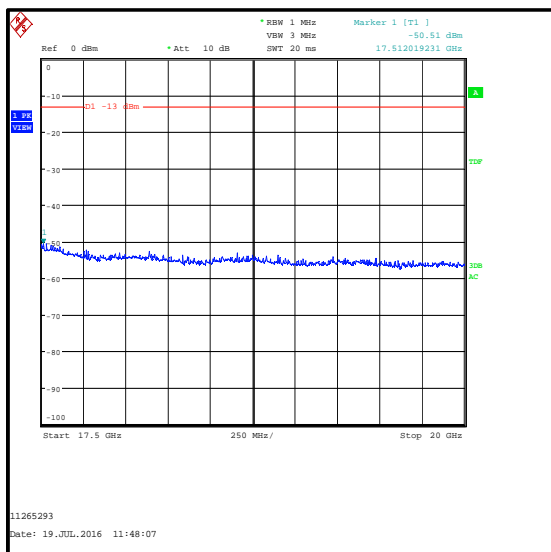
**Note(s):**

1. The uplink traffic channel is shown on the 1 GHz to 3 GHz plot.
2. No spurious emissions were detected above the noise floor of the measuring receiver, therefore the highest peak noise floor reading of the measuring receiver was recorded.
3. Middle channel results are recorded in this report and are representative of bottom and top channel results which are held on the UL IT server and available for inspection on request.
4. Measurements were performed in a semi-anechoic/fully anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres. A peak detector and trace mode of Max Hold were used to perform pre-scans, with markers placed on the highest measured levels.
5. Radiated spurious emission testing between 150 kHz and 30 MHz was performed for support of the NFC test report. No spurious emissions were observed above the noise floor of the measurement system

**Transmitter Out of Band Radiated Emissions (continued)****Results: HSUPA Sub-Test 3 - Middle Channel**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
1108.974	-31.9	-13.0	18.9	Complied



**Transmitter Out of Band Radiated Emissions (continued)****Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2003	Thermohygrometer	Testo	608-H1	45046641	22 Apr 2017	12
K0017	3m RSE Chamber	Rainford EMC	N/A	N/A	17 May 2017	12
M1995	Test Receiver	Rohde & Schwarz	ESU40	100428	21 Mar 2017	12
A2889	Antenna	Schwarzbeck	BBHA 9120 B	BBHA 9120 B	07 Apr 2017	12
A2890	Antenna	Schwarzbeck	HWRD 750	014	06 May 2017	12
A2892	Antenna	Schwarzbeck	BBHA 9170	9170-727	07 Apr 2017	12
A2863	Pre-Amplifier	Agilent	8449B	3008A02100	07 Jan 2017	12
A2891	Pre-Amplifier	Schwarzbeck	BBV 9718	9718-306	07 Apr 2017	12
A2893	Pre-Amplifier	Schwarzbeck	BBV 9721	9721-021	07 Apr 2017	12
A2914	High Pass Filter	AtlanTecRF	AFH-03000	2155	19 May 2017	12
A2918	Attenuator	AtlanTecRF	AN185W-20	832828#1	19 May 2017	12

**5.2.6. Transmitter Band Edge Radiated Emissions - LAT****Test Summary:**

<b>Test Engineer:</b>	David Doyle	<b>Test Date:</b>	15 July 2016
<b>Test Sample IMEI:</b>	358640070087482		

<b>FCC Reference:</b>	Parts 2.1053 & 24.238
<b>Test Method Used:</b>	KDB 971168 D01 Section 6.1 referencing FCC Part 24.238

**Environmental Conditions:**

<b>Temperature (°C):</b>	24
<b>Relative Humidity (%):</b>	39

**Note(s):**

1. Measurements were performed with the EUT transmitting in all operating modes.
2. Measurements were performed in a fully anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. The measurement antenna was placed at a fixed height of 1.5 metres above the test chamber floor in line with the EUT.
3. In the first 1.0 MHz immediately outside and adjacent to the band, the test receiver resolution bandwidth was set to approximately 1% of the occupied bandwidth and video bandwidth 3%. Sweep time was set to 10 seconds and an average detector with maximum hold was used.

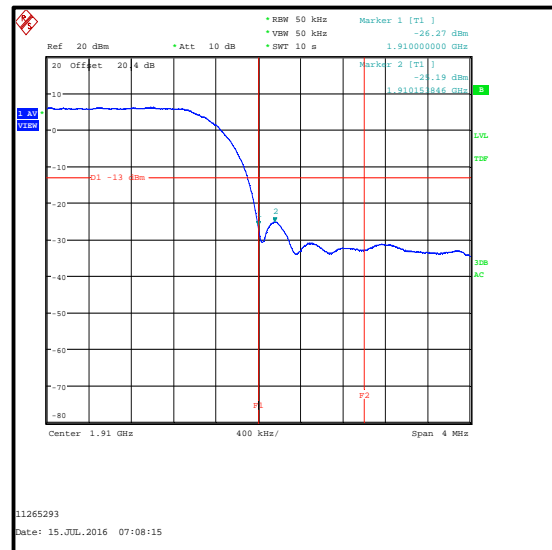
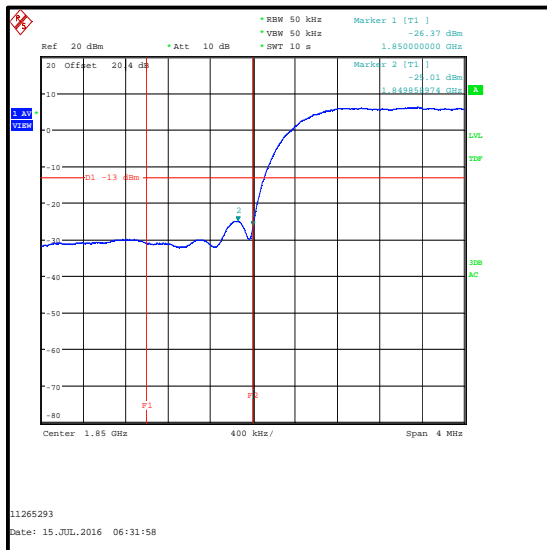
**Transmitter Band Edge Radiated Emissions (continued)****Results: RMC / 12.2 kbps**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
1849.853	-24.3	-13.0	11.3	Complied
1850	-24.7	-13.0	11.7	Complied
1910	-24.5	-13.0	11.5	Complied



**Transmitter Band Edge Radiated Emissions (continued)****Results: HSDPA Sub-Test 1**

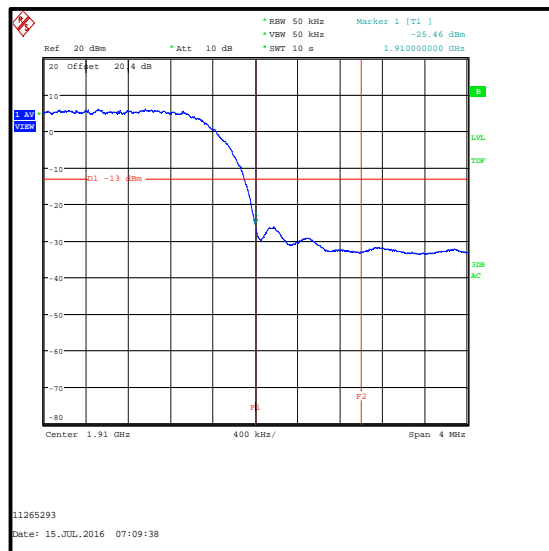
Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
1849.859	-25.0	-13.0	12.0	Complied
1850	-26.4	-13.0	13.4	Complied
1910	-26.3	-13.0	13.3	Complied
1910.154	-25.2	-13.0	12.2	Complied





**Transmitter Band Edge Radiated Emissions (continued)****Results: HSDPA Sub-Test 2**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
1850	-24.9	-13.0	11.9	Complied
1910	-25.5	-13.0	12.5	Complied



**Transmitter Band Edge Radiated Emissions (continued)****Results: HSDPA Sub-Test 3**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
1850	-24.2	-13.0	11.2	Complied
1910	-24.5	-13.0	11.5	Complied



**Transmitter Band Edge Radiated Emissions (continued)****Results: HSDPA Sub-Test 4**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
1850	-24.0	-13.0	11.0	Complied
1910	-24.3	-13.0	11.3	Complied



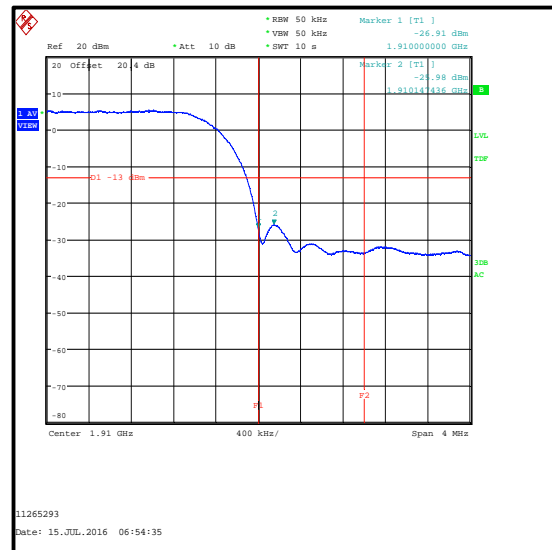
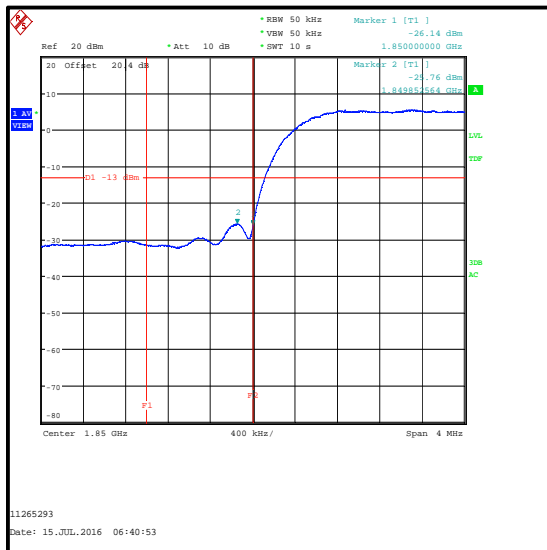
**Transmitter Band Edge Radiated Emissions (continued)****Results: HSUPA Sub-Test 1**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
1850	-24.7	-13.0	11.7	Complied
1910	-25.8	-13.0	12.8	Complied



**Transmitter Band Edge Radiated Emissions (continued)****Results: HSUPA Sub-Test 2**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
1849.853	-25.8	-13.0	12.8	Complied
1850	-26.1	-13.0	13.1	Complied
1910	-26.9	-13.0	13.9	Complied
1910.147	-26.0	-13.0	13.0	Complied



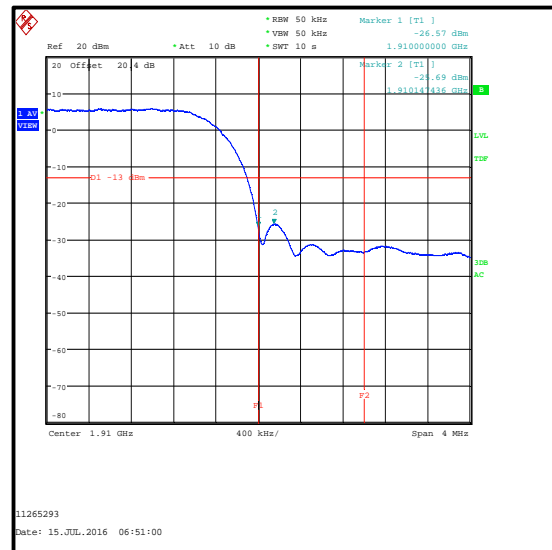
**Transmitter Band Edge Radiated Emissions (continued)****Results: HSUPA Sub-Test 3**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
1850	-24.0	-13.0	11.0	Complied
1910	-24.9	-13.0	11.9	Complied



**Transmitter Band Edge Radiated Emissions (continued)****Results: HSUPA Sub-Test 4**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
1849.840	-25.0	-13.0	12.0	Complied
1850	-26.5	-13.0	13.5	Complied
1910	-26.6	-13.0	13.6	Complied
1910.147	-25.7	-13.0	12.7	Complied



**Transmitter Band Edge Radiated Emissions (continued)****Results: HSUPA Sub-Test 5**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
1850	-25.5	-13.0	12.5	Complied
1910	-26.1	-13.0	13.1	Complied

**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2003	Thermohygrometer	Testo	608-H1	45046641	22 Apr 2017	12
K0017	3m RSE Chamber	Rainford EMC	N/A	N/A	17 May 2017	12
M1995	Test Receiver	Rohde & Schwarz	ESU40	100428	21 Mar 2017	12
A2888	Antenna	Schwarzbeck	VULB 9163	9163-941	07 Apr 2017	12
A2918	Attenuator	AtlanTecRF	AN185W-20	832828#1	19 May 2017	12



**5.2.7. Transmitter Band Edge Radiated Emissions - UAT****Test Summary:**

<b>Test Engineer:</b>	David Doyle	<b>Test Date:</b>	15 July 2016
<b>Test Sample IMEI:</b>	358640070309175		

<b>FCC Reference:</b>	Parts 2.1053 & 24.238
<b>Test Method Used:</b>	KDB 971168 D01 Section 6.1

**Environmental Conditions:**

<b>Temperature (°C):</b>	24
<b>Relative Humidity (%):</b>	39

**Note(s):**

1. Measurements were performed with the EUT transmitting in all operating modes.
2. Measurements were performed in a fully anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. The measurement antenna was placed at a fixed height of 1.5 metres above the test chamber floor in line with the EUT.
3. In the first 1.0 MHz immediately outside and adjacent to the band, the test receiver resolution bandwidth was set to approximately 1% of the occupied bandwidth and video bandwidth 3%. Sweep time was set to 10 seconds and an average detector with maximum hold was used.

**Transmitter Band Edge Radiated Emissions (continued)****Results: RMC / 12.2 kbps**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
1849.846	-31.6	-13.0	18.6	Complied
1850	-32.1	-13.0	19.1	Complied
1910	-30.2	-13.0	17.2	Complied



**Transmitter Band Edge Radiated Emissions (continued)****Results: HSDPA Sub-Test 1**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
1849.846	-32.7	-13.0	19.7	Complied
1850	-33.2	-13.0	20.2	Complied
1910	-31.8	-13.0	18.8	Complied



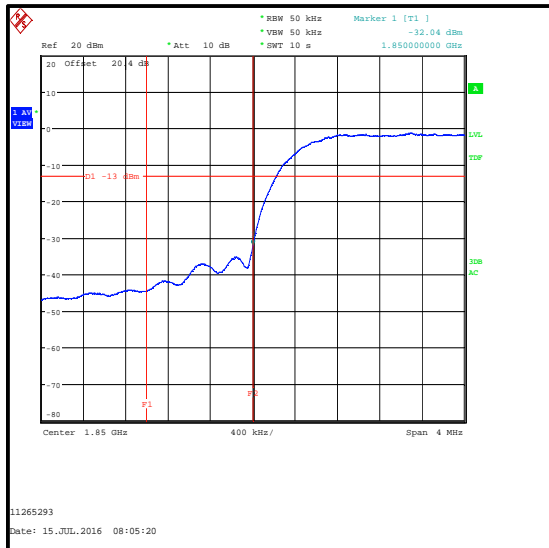
**Transmitter Band Edge Radiated Emissions (continued)****Results: HSDPA Sub-Test 2**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
1850	-32.5	-13.0	19.5	Complied
1910	-31.3	-13.0	18.3	Complied



**Transmitter Band Edge Radiated Emissions (continued)****Results: HSDPA Sub-Test 3**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
1850	-32.0	-13.0	19.0	Complied
1910	-31.2	-13.0	18.2	Complied



**Transmitter Band Edge Radiated Emissions (continued)****Results: HSDPA Sub-Test 4**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
1850	-32.0	-13.0	19.0	Complied
1910	-31.1	-13.0	18.1	Complied



**Transmitter Band Edge Radiated Emissions (continued)****Results: HSUPA Sub-Test 1**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
1850	-31.8	-13.0	18.8	Complied
1910	-31.5	-13.0	18.5	Complied



**Transmitter Band Edge Radiated Emissions (continued)****Results: HSUPA Sub-Test 2**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
1850	-33.1	-13.0	20.1	Complied
1910	-32.4	-13.0	19.4	Complied





**Transmitter Band Edge Radiated Emissions (continued)****Results: HSUPA Sub-Test 3**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
1850	-31.5	-13.0	18.5	Complied
1910	-31.0	-13.0	18.0	Complied



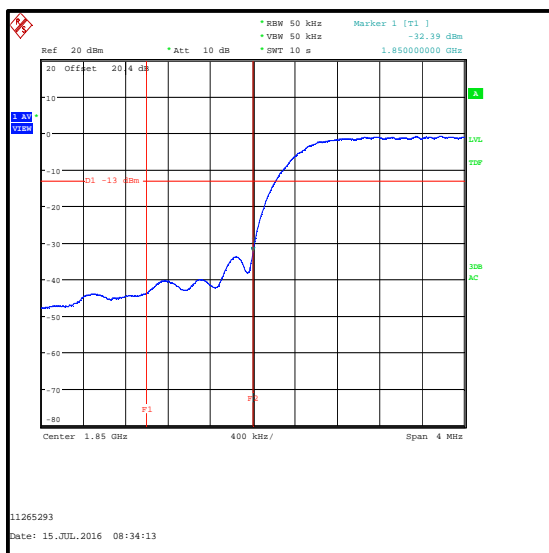
**Transmitter Band Edge Radiated Emissions (continued)****Results: HSUPA Sub-Test 4**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
1849.836	-32.8	-13.0	19.8	Complied
1850	-33.3	-13.0	20.3	Complied
1910	-31.8	-13.0	18.8	Complied



**Transmitter Band Edge Radiated Emissions (continued)****Results: HSUPA Sub-Test 5**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
1850	-32.4	-13.0	19.4	Complied
1910	-31.5	-13.0	18.5	Complied

**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2003	Thermohygrometer	Testo	608-H1	45046641	22 Apr 2017	12
K0017	3m RSE Chamber	Rainford EMC	N/A	N/A	17 May 2017	12
M1995	Test Receiver	Rohde & Schwarz	ESU40	100428	21 Mar 2017	12
A2888	Antenna	Schwarzbeck	VULB 9163	9163-941	07 Apr 2017	12
A2918	Attenuator	AtlanTecRF	AN185W-20	832828#1	19 May 2017	12

**5.2.8. Transmitter Frequency Stability (Temperature Variation)****Test Summary:**

<b>Test Engineer:</b>	Stefan Ho	<b>Test Dates:</b>	03 June 2016 & 09 June 2016
<b>Test Sample IMEI:</b>	358640070266615		

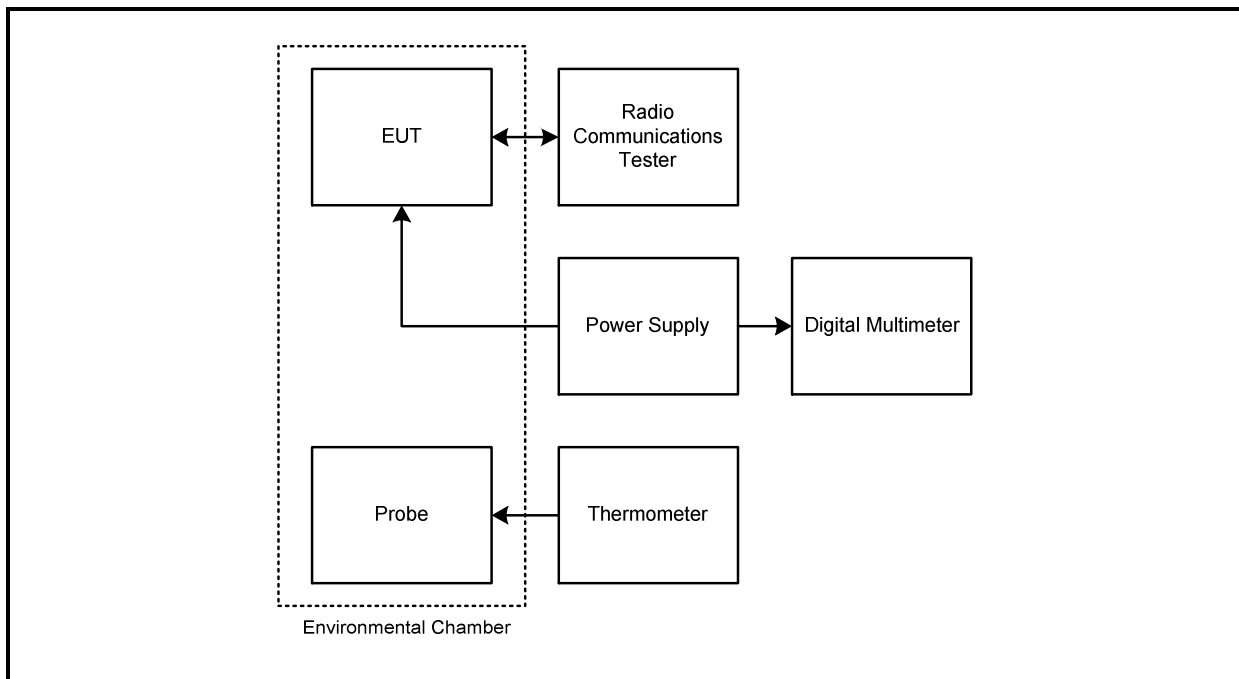
<b>FCC Reference:</b>	Parts 2.1055 & 24.235
<b>Test Method Used:</b>	KDB 971168 D01 Section 9.0 / ANSI/TIA-603-D-2010 Section 2.2.2 and FCC Part 2.1055
<b>Test Mode:</b>	RMC

**Environmental Conditions:**

<b>Ambient Temperature (°C):</b>	23
<b>Ambient Relative Humidity (%):</b>	46 to 48

**Note(s):**

1. Flying leads were connected internally to the EUT in place of the battery. These leads were extended and connected to a bench power supply.
2. Frequency error was measured using a calibrated Rohde & Schwarz CMW 500 Universal Radio Communications Tester in accordance with current Rohde & Schwarz application notes. The EUT was connected by suitable RF cables to the CMW 500. A bi-directional communications link was established between the EUT and CMW 500. The frequency meter value was recorded.
3. Temperature was monitored throughout the test with a calibrated digital thermometer. Nominal voltage was monitored throughout the test with a calibrated digital voltmeter.

**Test setup:**

**Transmitter Frequency Stability (Temperature Variation) (continued)****Results: Bottom Channel (1852.4 MHz)**

Temperature (°C)	Frequency Error (Hz)	Measured Frequency (MHz)	Lower Band Edge Limit (MHz)	Margin (MHz)	Result
-30	6	1852.400006	1850.0	2.400006	Complied
-20	4	1852.400004	1850.0	2.400004	Complied
-10	5	1852.400005	1850.0	2.400005	Complied
0	8	1852.399992	1850.0	2.399992	Complied
10	7	1852.399993	1850.0	2.399993	Complied
20	4	1852.400004	1850.0	2.400004	Complied
30	4	1852.400004	1850.0	2.400004	Complied
40	4	1852.400004	1850.0	2.400004	Complied
50	6	1852.399994	1850.0	2.399994	Complied

**Results: Top Channel (1907.6 MHz)**

Temperature (°C)	Frequency Error (Hz)	Measured Frequency (MHz)	Upper Band Edge Limit (MHz)	Margin (MHz)	Result
-30	8	1907.599992	1910.0	2.400008	Complied
-20	7	1907.599993	1910.0	2.400007	Complied
-10	4	1907.599996	1910.0	2.400004	Complied
0	4	1907.600004	1910.0	2.399996	Complied
10	4	1907.599996	1910.0	2.400004	Complied
20	7	1907.599993	1910.0	2.400007	Complied
30	7	1907.599993	1910.0	2.400007	Complied
40	7	1907.599993	1910.0	2.400007	Complied
50	6	1907.599994	1910.0	2.400006	Complied

**Transmitter Frequency Stability (Temperature Variation) (continued)****Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1869	Wideband Radio Comms Tester	Rohde & Schwarz	CMW 500	145923	05 April 2017	12
M1815	Environmental Chamber	Votsch	VT4002	521/83083	Calibrated before use	-
M1642	Thermometer	Fluke	52II	18890119	25 April 2017	12
S021	Dual DC power supply	Thurlby Thandar Instruments	CPX200	061034	Calibrated before use	-
M1269	Multimeter	Fluke	179	90250210	13 May 2017	12
M2002	Thermohygrometer	Testo	608-H1	45041825	02 April 2017	12

**5.2.9. Transmitter Frequency Stability (Voltage Variation)****Test Summary:**

<b>Test Engineer:</b>	Stefan Ho	<b>Test Date:</b>	02 June 2016
<b>Test Sample IMEI:</b>	358640070266615		

<b>FCC Reference:</b>	Parts 2.1055 & 24.235
<b>Test Method Used:</b>	KDB 971168 D01 Section 9.0 / ANSI/TIA-603-D-2010 Section 2.2.2 and FCC Part 2.1055
<b>Test Mode:</b>	RMC

**Environmental Conditions:**

<b>Temperature (°C):</b>	20
<b>Relative Humidity (%):</b>	48

**Note(s):**

1. Flying leads were connected internally to the EUT in place of the battery. These leads were extended and connected to a bench power supply.
2. Frequency error was measured using a calibrated Rohde and Schwarz CMW 500 Universal Radio Communications Tester in accordance with current Rohde and Schwarz application notes. The EUT was connected by suitable RF cables to the CMW 500. A bi-directional communications link was established between the EUT and CMW 500. The frequency meter value was recorded.
3. Voltage was monitored throughout the test with a calibrated digital voltmeter.

**Results: Bottom Channel (1852.4 MHz)**

Supply Voltage (V)	Frequency Error (Hz)	Measured Frequency (MHz)	Lower Band Edge Limit (MHz)	Margin (MHz)	Result
3.4	6	1852.400006	1850.0	2.400006	Complied
4.3	4	1852.400004	1850.0	2.400004	Complied

**Results: Top Channel (1907.6 MHz)**

Supply Voltage (V)	Frequency Error (Hz)	Measured Frequency (MHz)	Upper Band Edge Limit (MHz)	Margin (MHz)	Result
3.4	8	1907.599992	1910.0	2.400008	Complied
4.3	7	1907.599993	1910.0	2.400007	Complied

**Transmitter Frequency Stability (Voltage Variation) (continued)****Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1869	Wideband Radio Comms Tester	Rohde & Schwarz	CMW 500	145923	05 April 2017	12
S021	Dual DC power supply	Thurlby Thandar Instruments	CPX200	061034	Calibrated before use	-
M1269	Multimeter	Fluke	179	90250210	13 May 2017	12
M2002	Thermohygrometer	Testo	608-H1	45041825	02 April 2017	12



## **6. Measurement Uncertainty**

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor such that a confidence level of approximately 95% is maintained. For the purposes of this document "approximately" is interpreted as meaning "effectively" or "for most practical purposes".

<b>Measurement Type</b>	<b>Range</b>	<b>Confidence Level (%)</b>	<b>Calculated Uncertainty</b>
Conducted Output Power	1850 to 1910 MHz	95%	±1.13 dB
Frequency Stability	1850 to 1910 MHz	95%	±23 Hz
Occupied Bandwidth	1850 to 1910 MHz	95%	±3.92 %
Radiated Spurious Emissions	30 MHz to 1 GHz	95%	±5.65 dB
Radiated Spurious Emissions	1 GHz to 20 GHz	95%	±2.94 dB

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty the published guidance of the appropriate accreditation body is followed.

**7. Report Revision History**

Version Number	Revision Details		
	Page No(s)	Clause	Details
1.0	-	-	Initial Version
2.0	11,12,16 & 17	-	Corrected $\beta_c$ value for HSUPA Sub-test 1
3.0	8	-	At the request of the TCB: Section 4.2. Inserted Bullet 3

--- END OF REPORT ---